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Human Motion Detection using Key Frames Extraction and Shot Segmentation using Real-Time Algorithm

Allan I. Abraham [1], Prof. Sunil Kureel[2]
[1]*Mtech Scholar, Department of Electronics & Communication Engg, AIRT, Bhopal*
[2]*Asst. Prof., Department of Electronics & Communication Engg, AIRT, Bhopal*

Abstract: Key frames and previews are two forms of a video abstract, widely used for various applications in video browsing and retrieval systems. We propose in this paper a novel method for generating these two abstract forms for an arbitrary video sequence. The underlying principle of the proposed method is the removal of the visual-content redundancy among video frames. This is done by first applying key frame algorithm in a video sequence and then selecting the most suitable frames among all the frames and then applies segmentation technique procedure. In the last step, key frames are selected as centroids of obtained optimal clusters. Video shots, to which key frames belong, are concatenated to form the preview sequence.

Index Terms— Motion Detection, Image segmentation, Background Detection, Movement Detection

1. INTRODUCTION

In this thesis, we are consider a problem of human motion detection, in which we are interested in recognizing humans based solely on the characteristic of extracting the frames [2]. This methodology is different from other techniques for human detection, such as those that recognize humans based on shape, color, texture, or surface features [7]. This thesis presents a fully module system for human motion detection that can be deployed in the field. Its characteristics include real-time performance, insensitivity to background clutter and movement, and a modular design that can be generalized to other types of motion[6].

Related summary of work

Most of the studies in this field use detection algorithm as the key idea. Jin [10] proposed a method to identify video shots with people based on motion detection. The category of the shot was considered to be "people", only if there is at least one image with maximum number of frames within that shot. One of the three features chosen by Huang et al. [13] to be evaluated in the video Evaluation (2006) was "People" feature, Huang et al., state that segmentation process of video to reduce complexities in the videos. Base paper consist of Humanoid Robot(HR) which detect the
at least five human features, used for mimicking filter to detect human motion, followed by the Edge detection algorithm which was proposed by Wei and Sethi.

A. Human Tracking and Predecting

From the literature reviews done, it can be concluded that most common way in human detection or tracking is by segmentation process. Human features is the most unique object, and if it is accurately detected it leads to robust human existence detection and tracking.

B. Motion Detection

Very few still images, video sequences hold more details about the history of moving objects (foreground), which help in to isolate the foreground from the background. Generally, the moving areas are detected by finding the changes that happen among the sequences of images [1], [2].Most of the research done in movement detection applied pre-processing steps before applying the change detection algorithms, [2]. Such pre-processing steps involve geometric and intensity adjustments. The problem of variation in light intensity is solved by intensity adjustment in which illumination effect is reduced to some degrees based on the method used. Elgammal et al. [1], state that transforming the RGB values, into chromatic color space makes the module insensitive to the small changes in the illumination. There are several ways for detecting a change in a video sequence [2]. Recent studies agree that Image differencing method is more effective than others in change detection [3].

2. PROPOSED METHODOLOGY

Our proposed method comprises of following steps:

1. Converting a video sequence in to individual images.
2. Accessing the sequential images and detecting the important features.
3. Allocating those regions (if any) giving indications of human presence.
4. Applying movement detection test for all of the allocated regions.
5. Applying face detector to those detected moving objects to detect if it is a face or not.

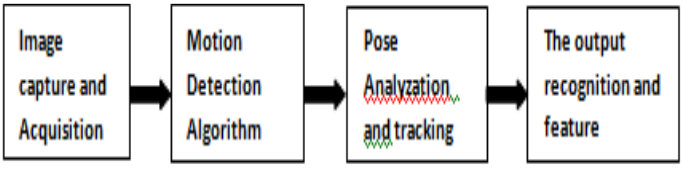

Figure 1: Proposed Algorithm Steps

For example, when a moving object stopped, it would then be

a part of the background image. Clearly, the foreground objects can be acquired by using simple arithmetic using image subtraction. [23] The result of the subtraction techniques where pixels belonging to the current image are subtracted by the corresponding pixels in the background image or vice versa would obtain the foreground moving objects

Stage 2: Frames Area Detection

In this stage color information of the digital image is utilized to find those areas close to human skin color. This stage helps in reducing the search space and therefore speeds up the simulation by consuming the processing time efficiently. However, skin test is not enough to detect human faces as it will also detect other parts of the body as well as other non face skin colored objects. Thus, other tests to filter out those unwanted areas should be applied. Further stages in the proposed project are designed to gradually eliminate the false detected areas found at this stage. The first test to remove the unwanted skin like areas was chosen to be movement detection.

To minimize the errors in face detection we can utilize the human nature that human will have at least small amount o movements such as eyes blinking and/or mouth and face boundary movements

Video Clips

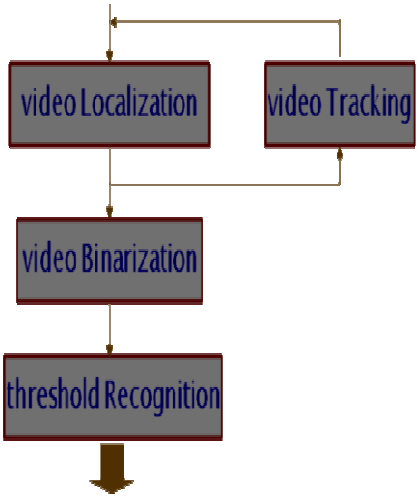

Figure 2: Proposed Algorithm for Key Frame Extraction

Stage 4: Face Detection

To insure that the moving part is a face, additional tests are required. In this stage, the moving objects which were detected in the previous stage are examined to identify if any of them is a face by examining the pass of the following four tests, one based on the Geometrical test that indentifies the geometrical structure , second it identifies the face as in case of the video as we have number of frames so by comparing the previous frame with present frame that helps in finding the face in the frame as in case of normal face doesn't move quickly, third test involves registration of face from the outline of face and locating features as eyes, lips and in last fourth test involves the image which has passed above two steps is here verified with the sample human face structure for confirming the human face registration.

Video Segmentation:

Each frame is divided into number of blocks with m rows and n columns. Then we apply the subtracting algorithmof the corresponding blocks between two random frames and it is implemented. Finally, the final difference of two frames is obtained by adding up all the differences through different weights.

3. EXPERIMENTAL RESULTS

These numbers of frames we can discard the remaining frames before which the motion is detected. By this method we would select the frame which is just occurring before the frame where the motion is detected so the number of frames required for the detection is reduced substantially hence fourth reducing the bandwidth of the system. From the figure below you can see the changes is occurring after 26 frame so from the frame 1 to 25 we can select few and thus on same way we can proceed further for detection of movement.

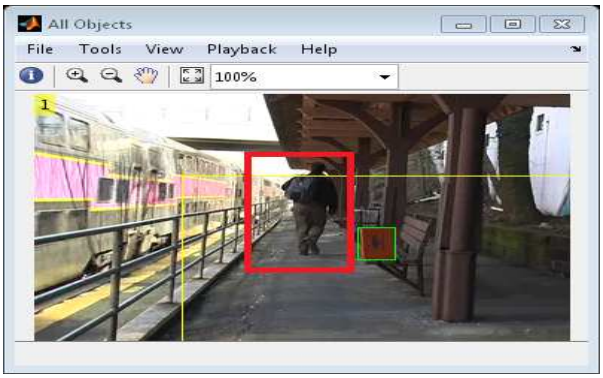

Figure 3: Result

The red box highlighted in the above figure indicates the motion tracking of a human in a captured camera after which the movement is observed similarly next frame. This method is convenient as compared to other where the typical features are extracted from the image and then compared with the sample images for detection purpose of motion. Here in this case we find out the outline of the human body from the image and differentiate it with respect to background for the detection purpose. Here we perform image segmentation and in that we divide image part into small parts then we subtract it with the reference frame and find out the difference between them that validates the human presence.

4. CONCLUSION & FUTURE WORK

Finding an alternative way of abstracting a video, such that the results are similar to those obtained manually, is a highly difficult task. This remain so even if we do not attempt to exactly map the human cognition onto the machine level, and if we constraint the applicability of the developed automated video-abstracting method only on the "objective" video summarization. Therefore, we have developed the method, presented in this report, with the objective of capturing the same types of structure of the video materials into the abstract and of keeping the similar abstract size, compared to the manual abstraction.

We had presented a research on some image processing techniques implemented for motion detection algorithms and

also some of the methodology and approaches of implementing a motion detection algorithm itself.

There are still many areas which can be further researched from this point onwards. For example, the techniques introduced may be enhanced to suit some problem specific applications or some domain specific applications. Also the techniques may be further enhanced by implementing more useful methods and algorithms such as those involving with tracking the object which causes the motion events such as those using optical flows or also known as image flows. Here, human motions are being detected. However, future works may also want to recognise the pose or gesture of the human body registered by the algorithm implemented here in the prototype system.

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